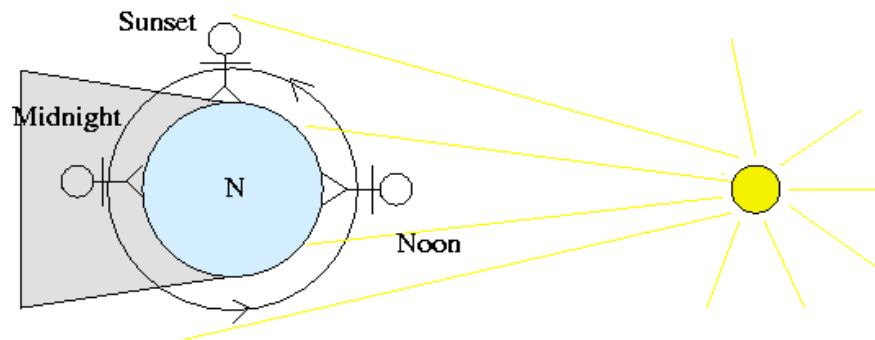


Earth Motions

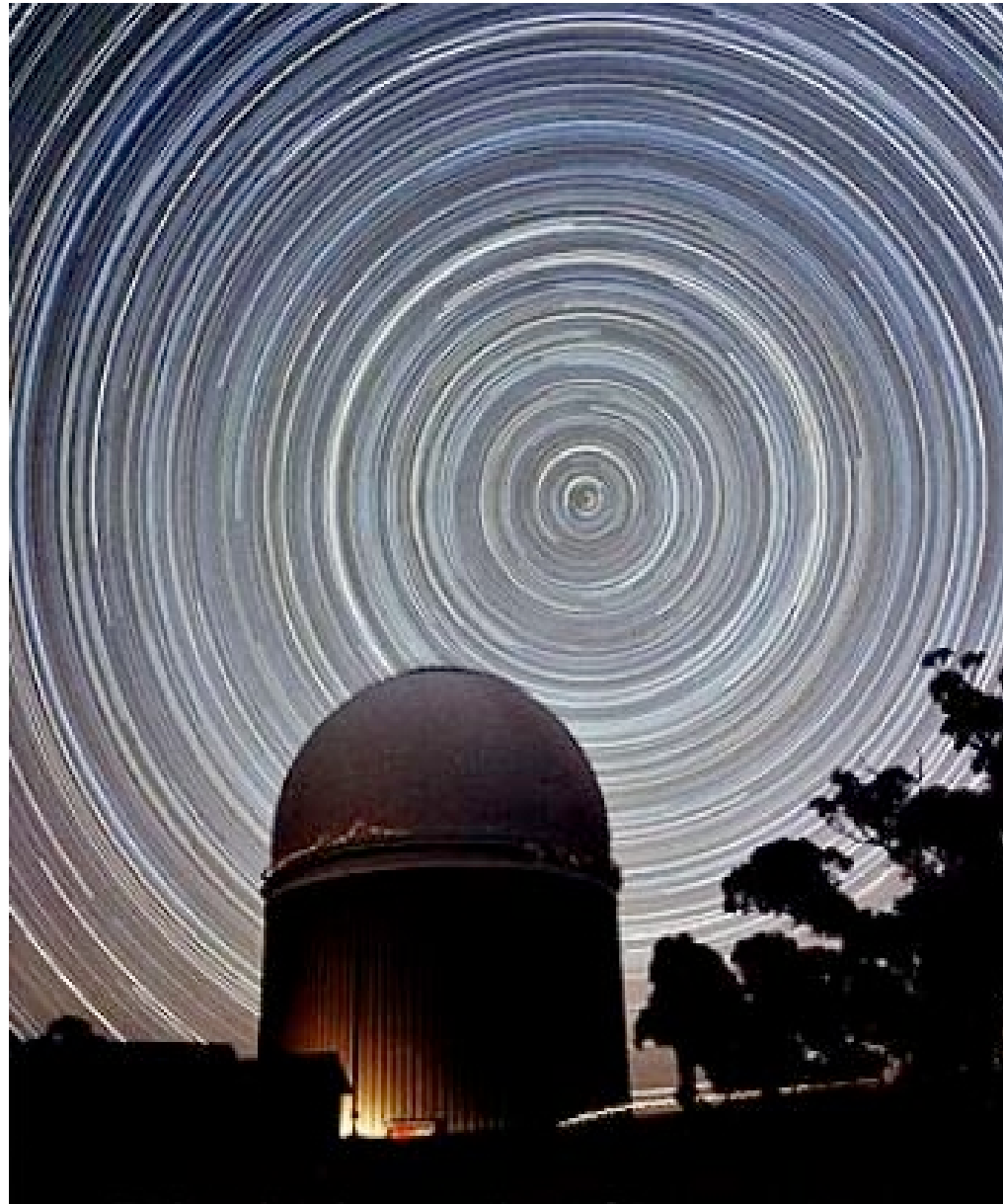


- Why is there day and night?

OR

- Why do the Sun and stars appear to move through the sky?

Because the Earth rotates around its N-S axis once every 24 hrs



- How fast is a gaucho napping at the equator travel due to the Earth's rotation?

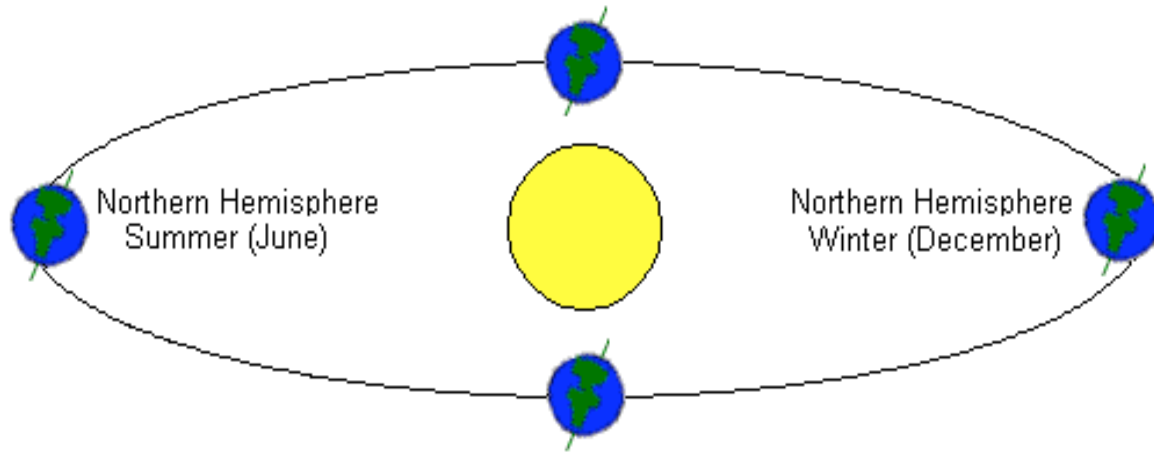
Travels 24,000 miles in a day:

$$\text{Speed} = \text{Distance}/\text{time}$$

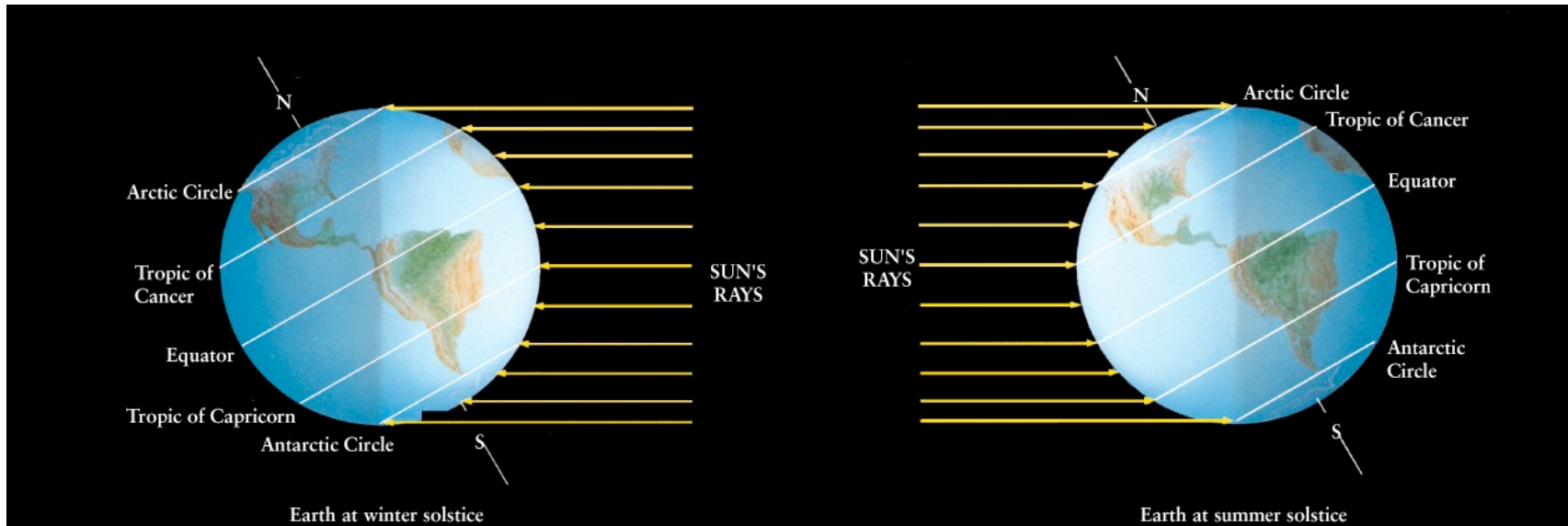
$$S = 24000\text{miles}/24\text{hours}$$

$$S = 1000 \text{ miles}/\text{hour}$$

The Reason for Seasons



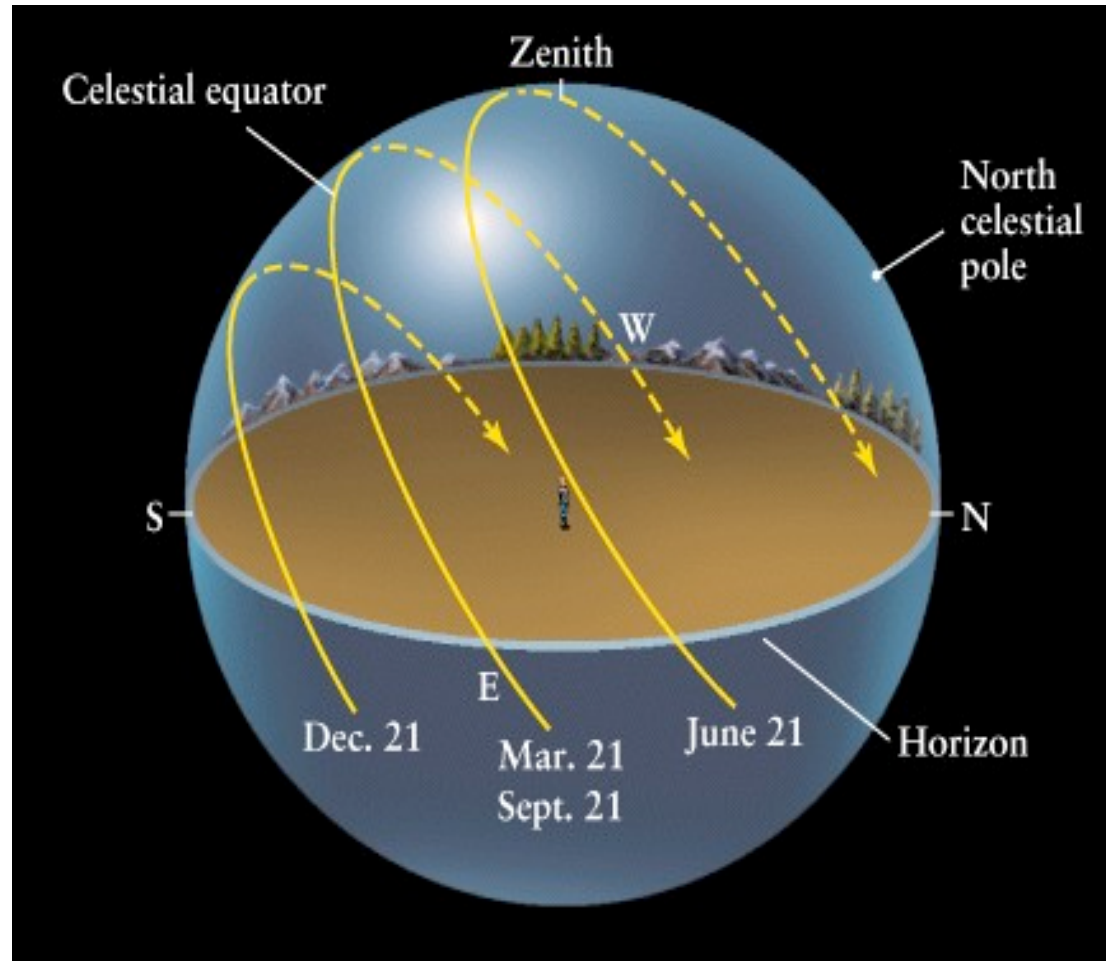
- The Earth is in a slightly elliptical orbit around the Sun - we are *furthest* from the Sun during the Northern Hemisphere summer.
- It is the *tilt* of the Earth's axis with respect to orbit plane that is the cause of the seasons.



Dec 21 Southern hemisphere summer, Sun is directly above the Tropic of Capricorn

June 21 Northern hemisphere summer, Sun is directly above the Tropic of Cancer

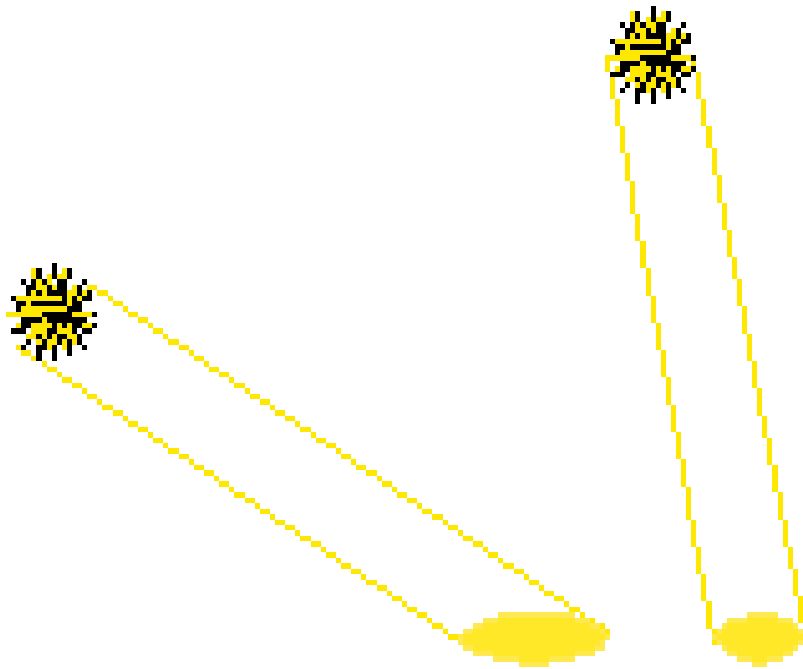
Sun's Path Through the Year



Reason for Seasons cont.

The tilt has two main effects.

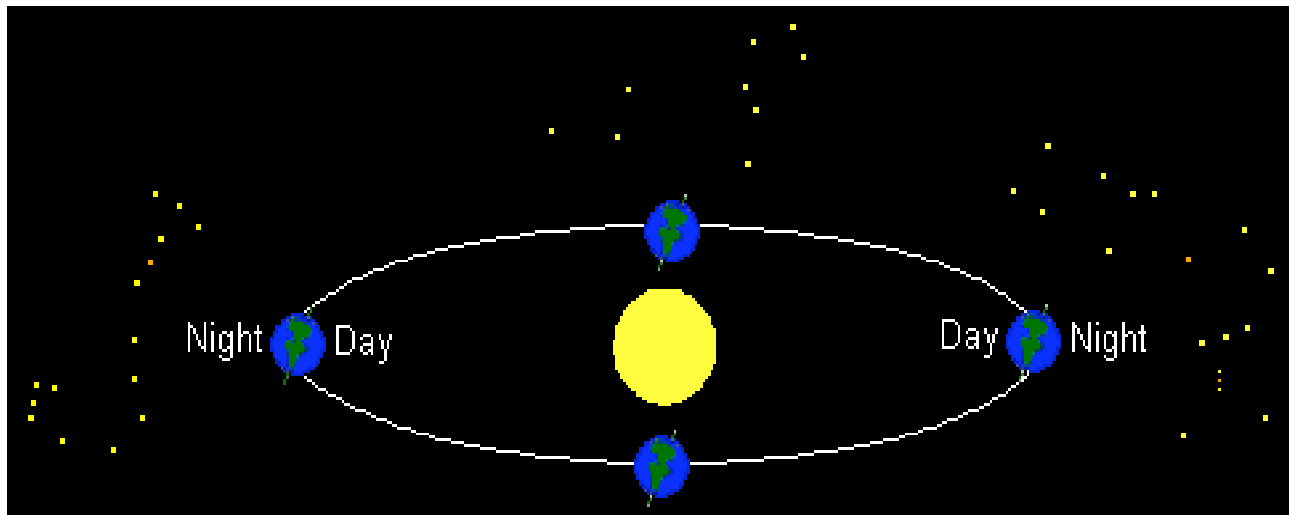
- 1) The path the Sun takes through the sky changes during the year (look to the South to see the Sun in the winter, over head in the summer). Fewer daylight hours in the Winter.
 - 2) The intensity of sunlight decreases in the winter (the Sun is at a larger angle from the zenith).
- So, it is cold in the winter.



- The solar energy per unit area decreases as the Sun moves lower in the sky. This is the reason it is cooler in the winter and in the morning.afternoon.

The Night Sky at Different Seasons

- We see different stars at different times of the year. The stars are always there, but can only be seen against the dark night sky.



- How fast is the Earth moving in its orbit around the Sun?

$$S = D/t$$

$$D = 2\pi R \quad R = 94 \times 10^6 \text{ miles}$$

$$t = 1 \text{ year}$$

$$S = 5.85 \times 10^8 \frac{\text{miles}}{\text{year}} \times \frac{1 \text{ year}}{365 \text{ days}} \times \frac{1 \text{ day}}{24 \text{ hr}} = 66,800 \frac{\text{miles}}{\text{hour}}$$

- How fast is the Earth moving in its orbit around the Sun?

$$S = D/t$$

$$D = 2\pi R \quad R = 94 \times 10^6 \text{ miles}$$

$$t = 1 \text{ year}$$

$$S = 5.85 \times 10^8 \frac{\text{miles}}{\text{year}} \times \frac{1 \text{ year}}{365 \text{ days}} \times \frac{1 \text{ day}}{24 \text{ hr}} = 66,800 \frac{\text{miles}}{\text{hour}}$$

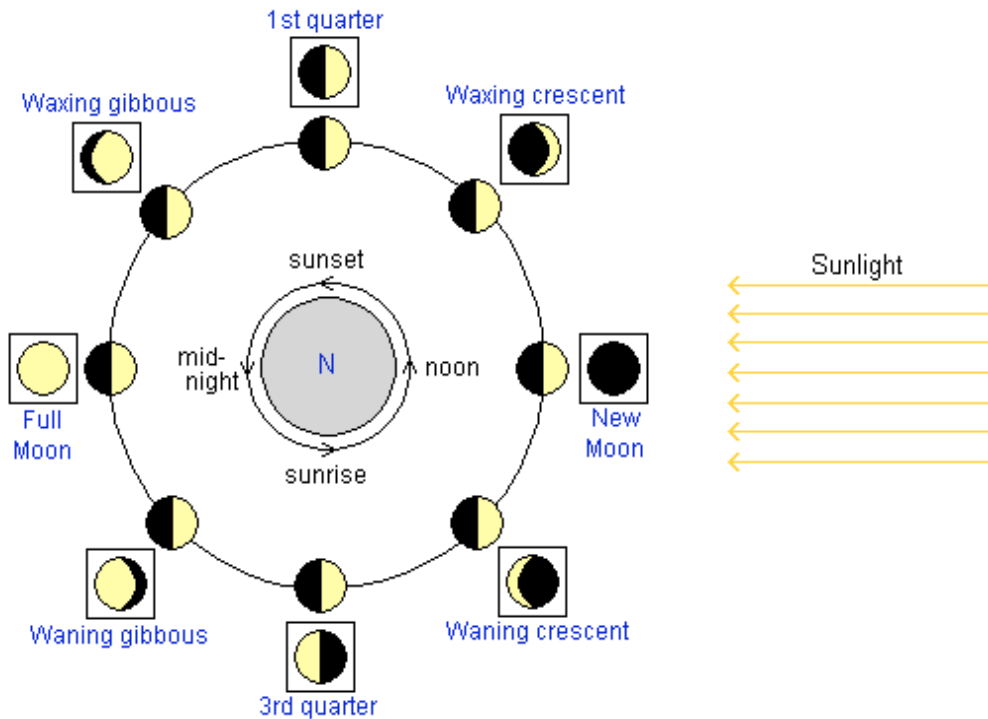
Funny way to write 1

Motions of the Earth



- Stuff everyone should know

Moon phases



- The moon phases are due to the relative positions of the Sun and moon. One half of the moon is always illuminated, it is only a question of what fraction of the illuminated face we can see from the Earth.

Q. What time does the full moon rise?

- a) At midnight
- b) At sunrise
- c) At sunset
- d) Any old time, this is a trick question.

Q. What time does the full moon rise?

a) At midnight

b) At sunrise

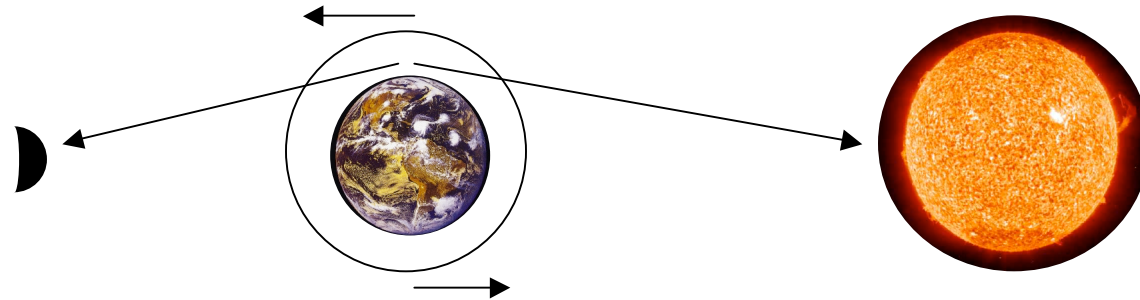
c) At sunset <<<

d) Any old time, this is a trick question.

Full moon rise ('top view')

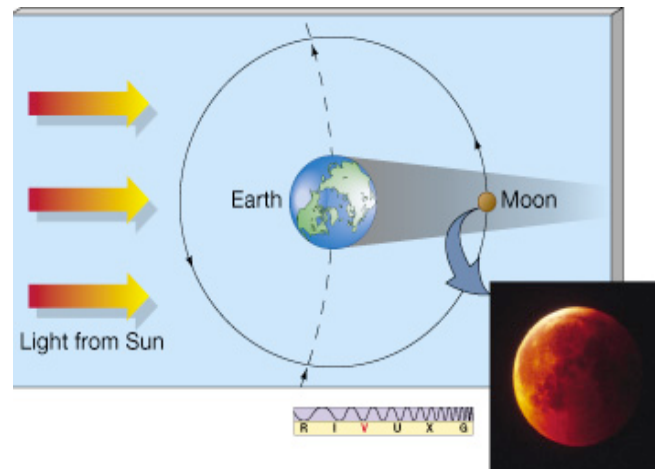
Look east to rising
full moon

Look west to setting Sun

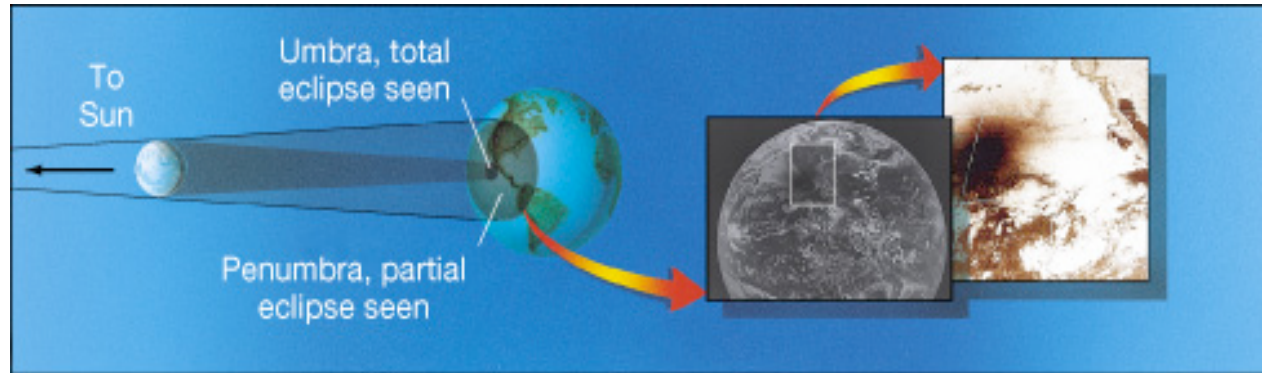


Lunar Eclipse

- For a full moon, the Sun, Earth and Moon are all aligned. The Moon can fall into the shadow of the Earth. This is called a lunar eclipse.



Solar Eclipse



- A similar thing can happen during the new moon. The Moon can cast a shadow on the Earth when it passes in front of the Sun.

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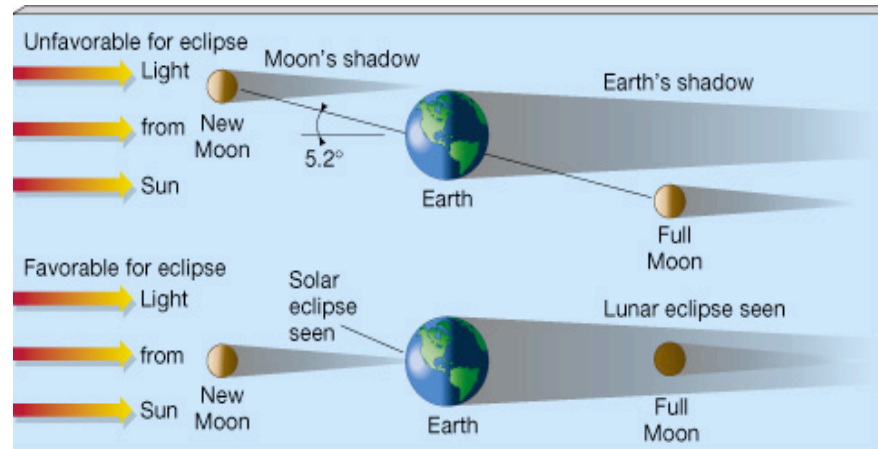




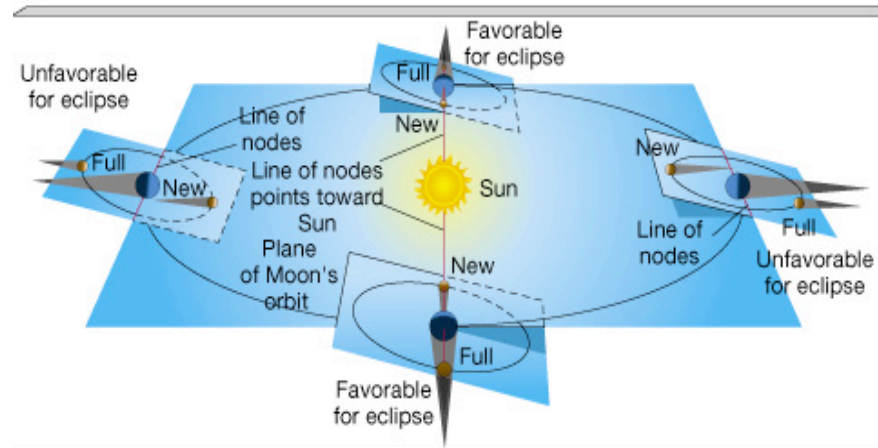
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Why don't we have an eclipse every month?



(a)



(b)